The Impact of Chair Type and Keyboard Positioning on Musculoskeletal Responses during a Prolonged Sitting Exposure

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Prolonged sitting exposures have been linked to low static loading, limited movement, flexed spine posture, and altered muscle responses, and in ~50% of participants developed low back pain (Callaghan & McGill, 2001; Gerr et al., 2004; Nairn et al., 2013). Since office workers are spending ~77% of each day sitting (Stand UP Australia, 2009), chair type has the potential to improve quality of sitting and reduce pain development. Quality sitting is characterized by low variable loading and muscle activation, less flexed spine posture, and small regular movements. Despite having highly adjustable chairs, users do not tend to adjust their chairs during the workday (Vink et al., 2007). Even if users do adjust their chair, they tend to make minimal or no contact with the backrest (Van Niekerk et al., 2015). Additionally, task type requiring different arm positions (elbow angles) was shown to alter trunk kinematics and erector spinae (ES) muscle activity during a prolonged sitting exposure (Van Dieën et al., 2001). Likewise, this study will examine the impact of chair type and arm positioning on the quality of sitting during a 2-hour prolonged exposure. Briefly, 10 male and 10 female participants will be recruited to perform seated computer-based office work, in 30min blocks of each of four combinations of two arm positions (elbow angles of 90° and 120°) and two chair types (fixed back and dynamic back). Full body kinematics (inertial measurement units and optoelectronic motion capture), 8-bilateral channels of trunk and pelvis EMG, seat back and pan pressure distributions (pressure mats), and self-reported pain (100mm visual analog scale) will be used to quantify movement, spine and pelvis angles, muscle activity, and transient pain. Key measures of EMG include gaps analyses (duration and frequency) and muscle co-contraction. It is expected that the dynamic back chair and 120° elbow angle will reduce pain ratings and facilitate quality sitting. This work is relevant to all seated workers, and of interest in the ergonomics community.